Reshaping and Forging silicon/silicon alloy members

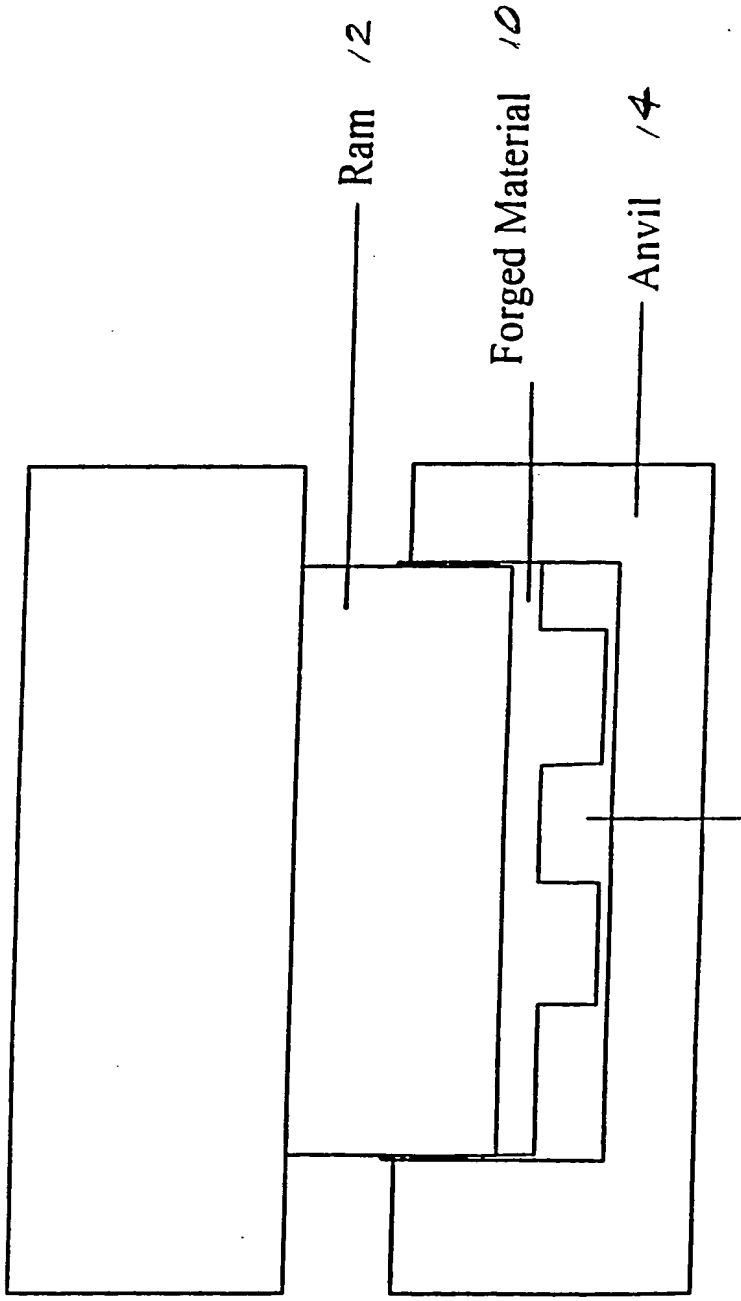


FIG. 1

High temperature vacuum/special gas atmosphere reshaping and forging silicon/silicon alloy members

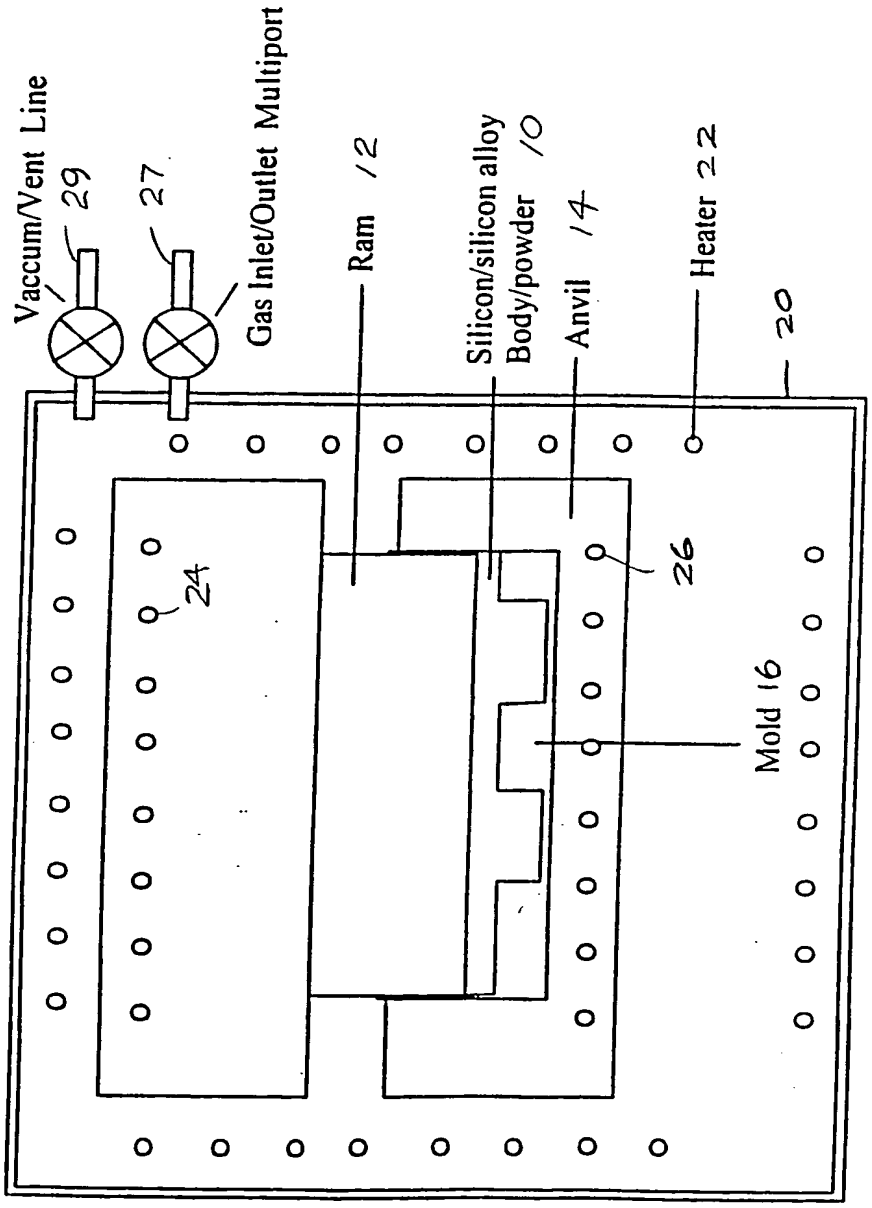


FIG. 2

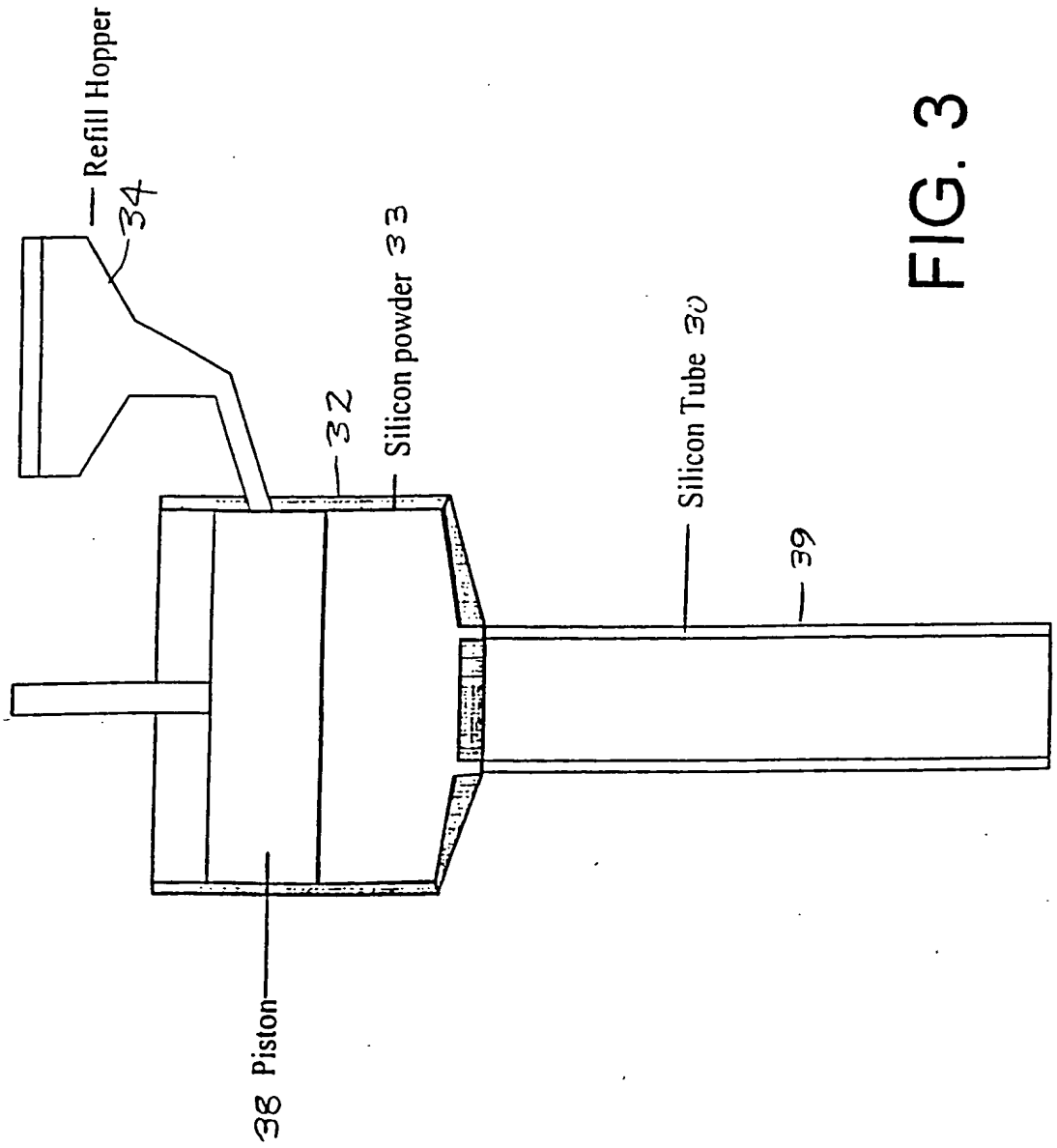

Refill Hopper
34
32
Silicon powder 33
Silicon Tube 30
39
38 Piston

FIG. 3

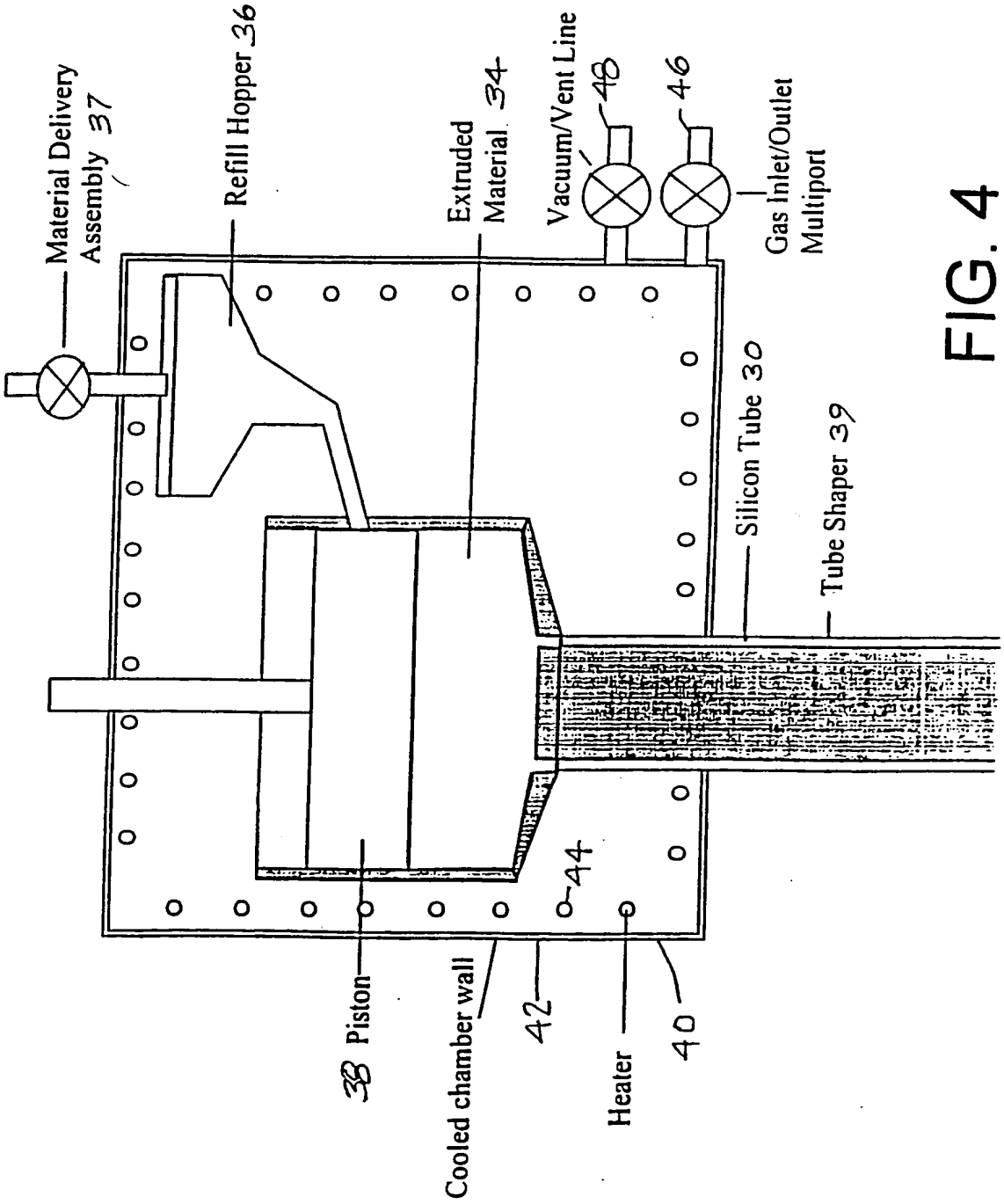

Material Delivery Assembly 37
Refill Hopper 36
Extruded Material 34
Vacuum/Vent Line 48
46
Gas Inlet/Outlet Multiport
Silicon Tube 30
Tube Shaper 39
44
38 Piston
Cooled chamber wall
42
Heater
40

FIG. 4

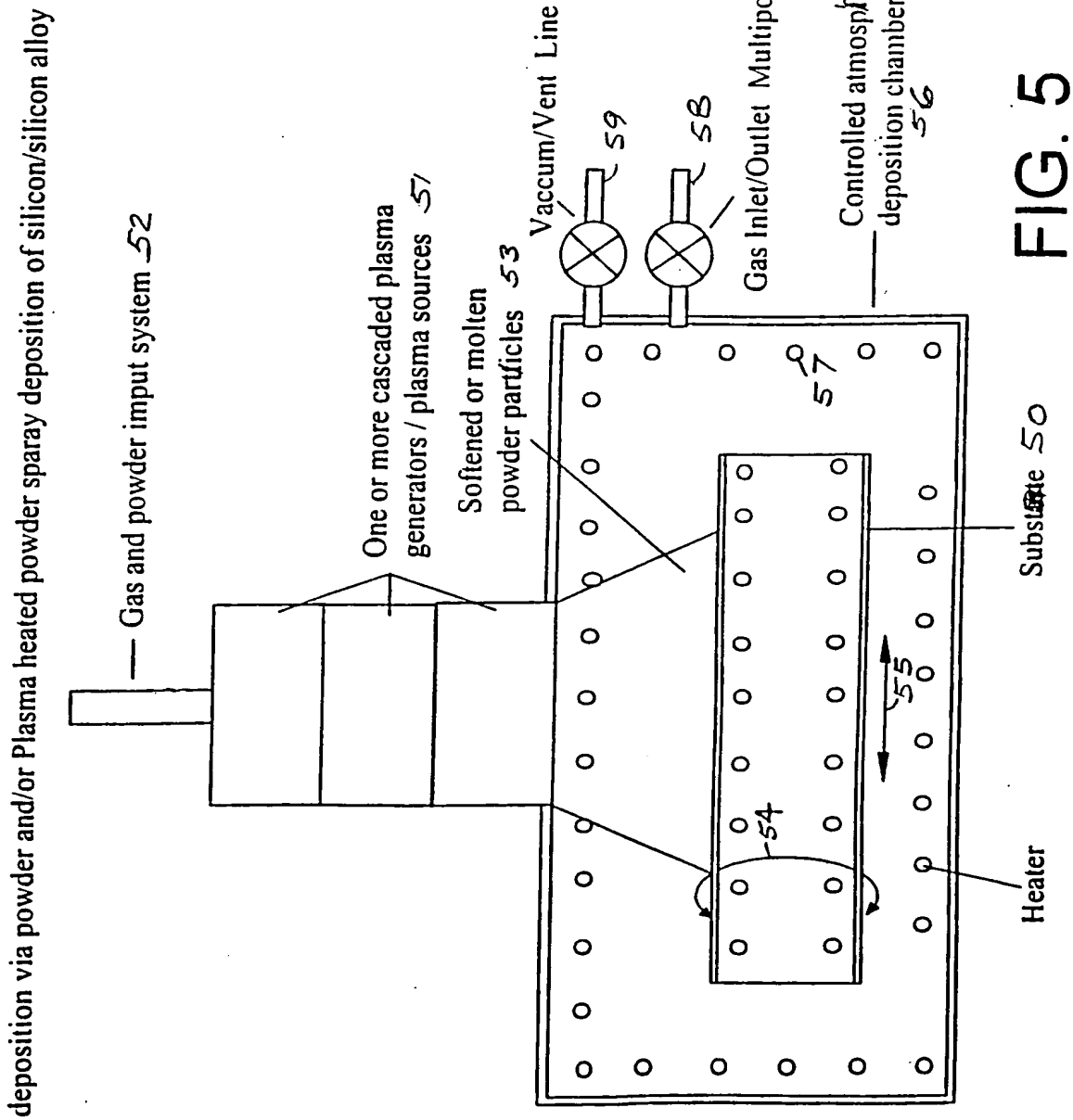

Material deposition via powder and/or Plasma heated powder sparay deposition of silicon/silicon alloy
Gas and powder imput system 52
One or more cascaded plasma generators / plasma sources 57
Softened or molten powder particles 53
Vaccum/Vent Line
59
58
Gas Inlet/Outlet Multiport
Controlled atmosphere deposition chamber 56
57
Substrate 50
55
54
Heater

FIG. 5

Silicon / silicon alloy slurry spray silicon memeber fabrication method

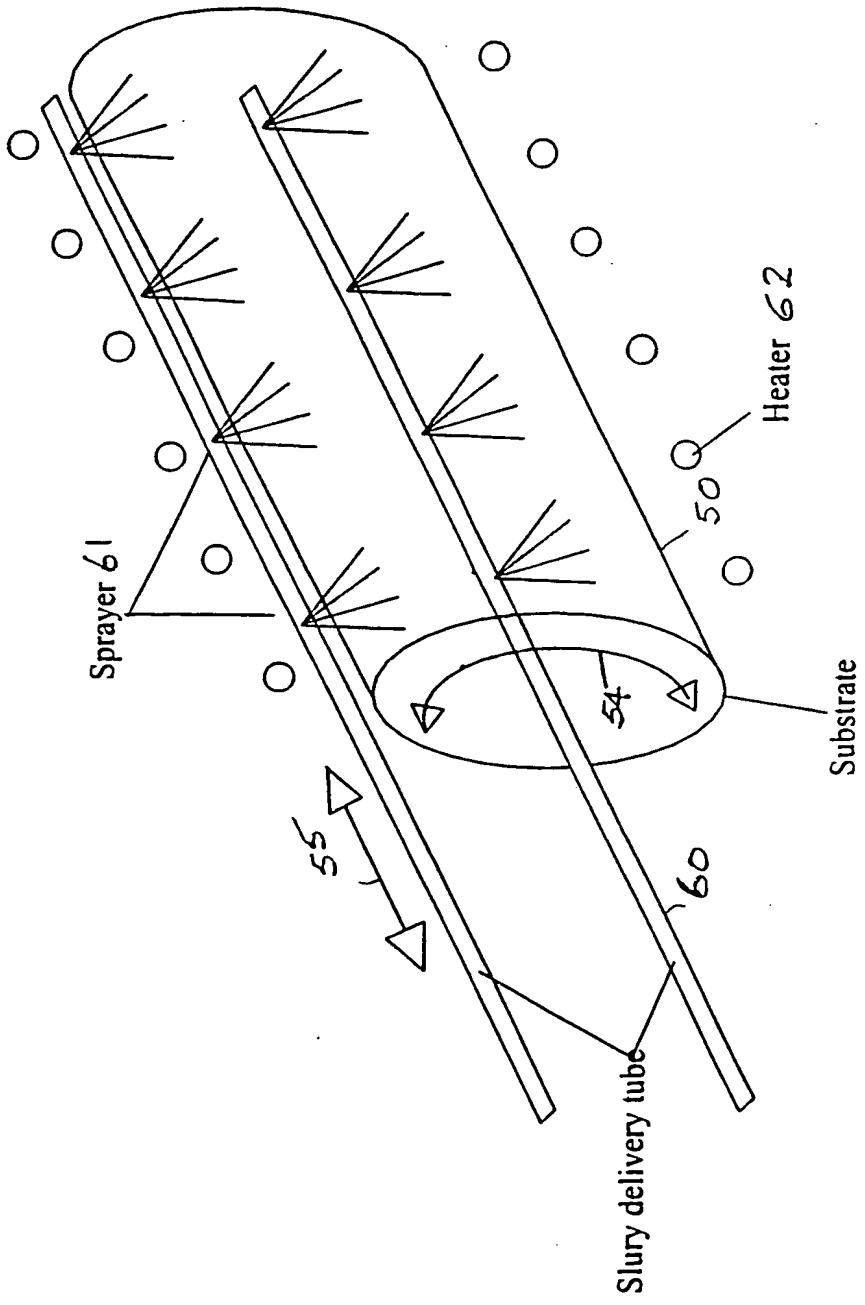


FIG. 6

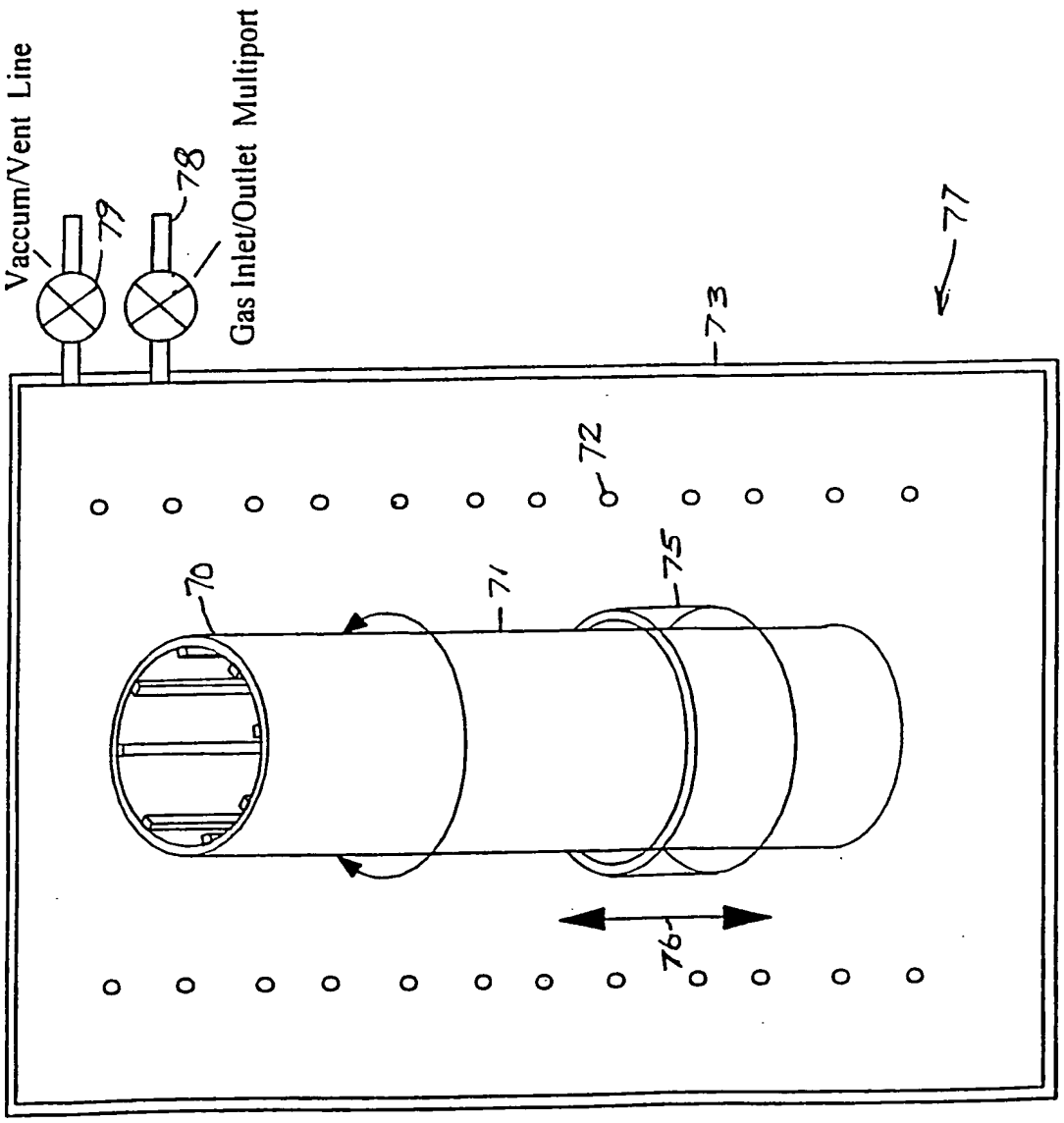


FIG. 7

Silicon / silicon alloy tubing for liner or wafer boat fabrication

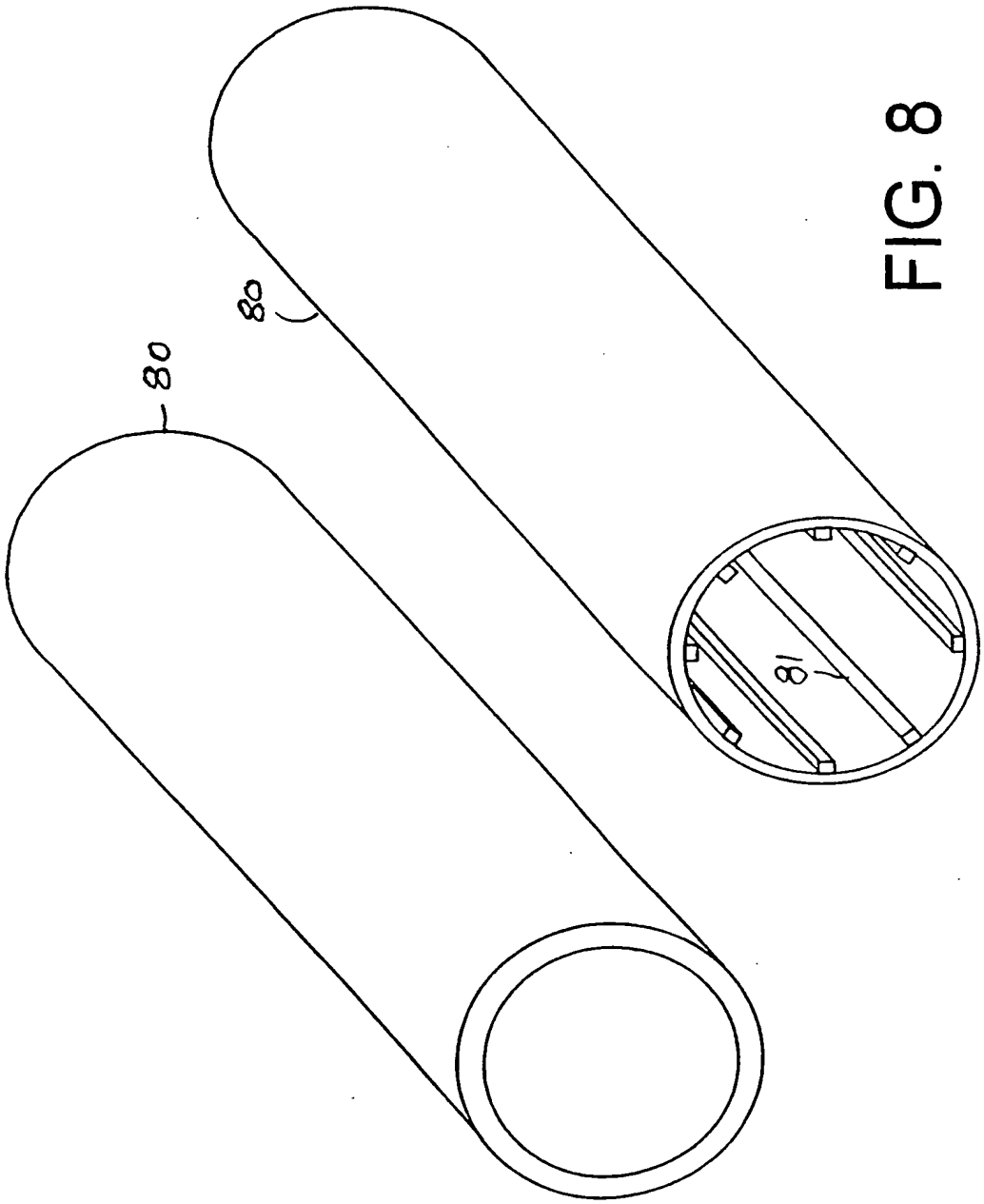


FIG. 8

Silicon / silicon alloy tubing for liner or wafer boat fabrication

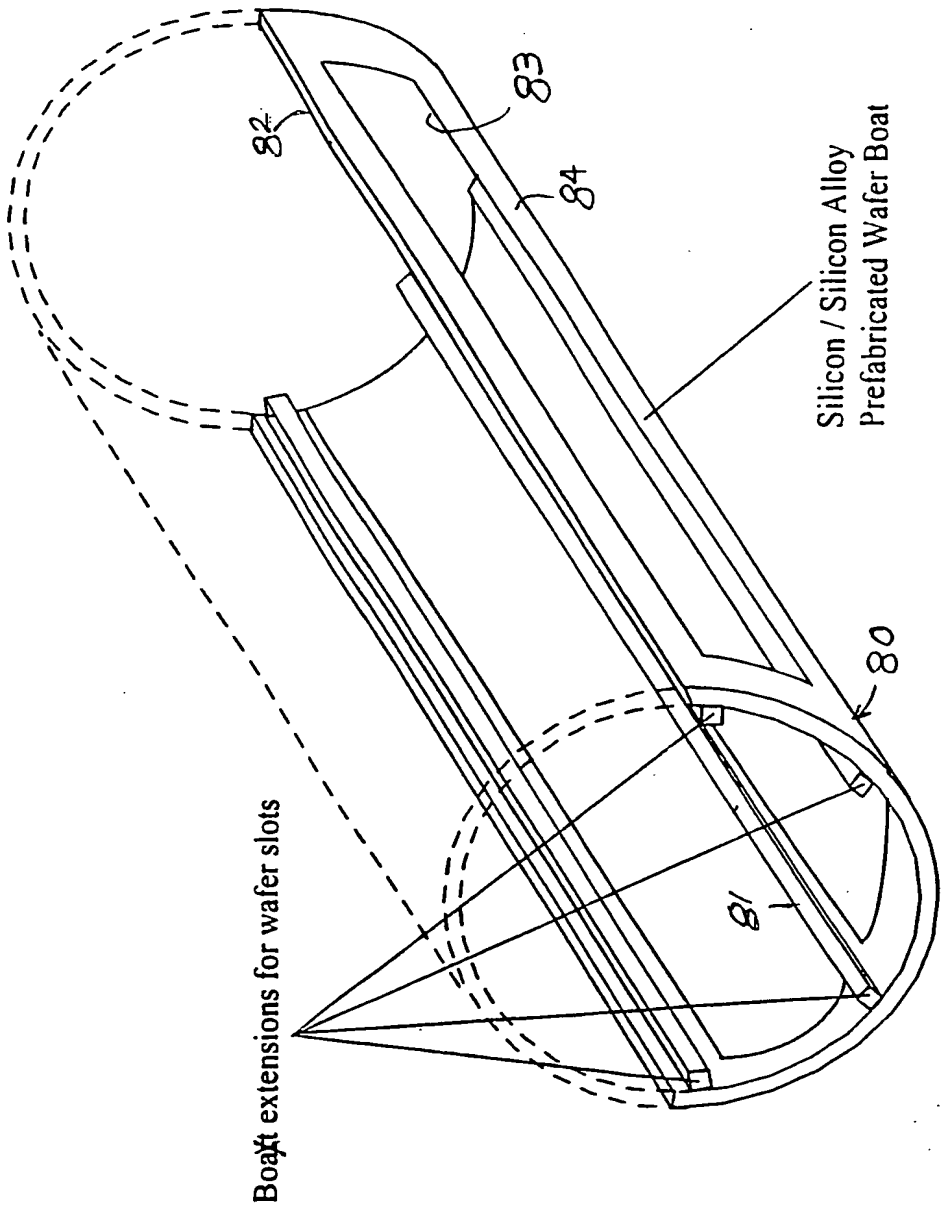

82
83
84
Silicon / Silicon Alloy
Prefabricated Wafer Boat
80
81
Boat extensions for wafer slots

FIG. 9

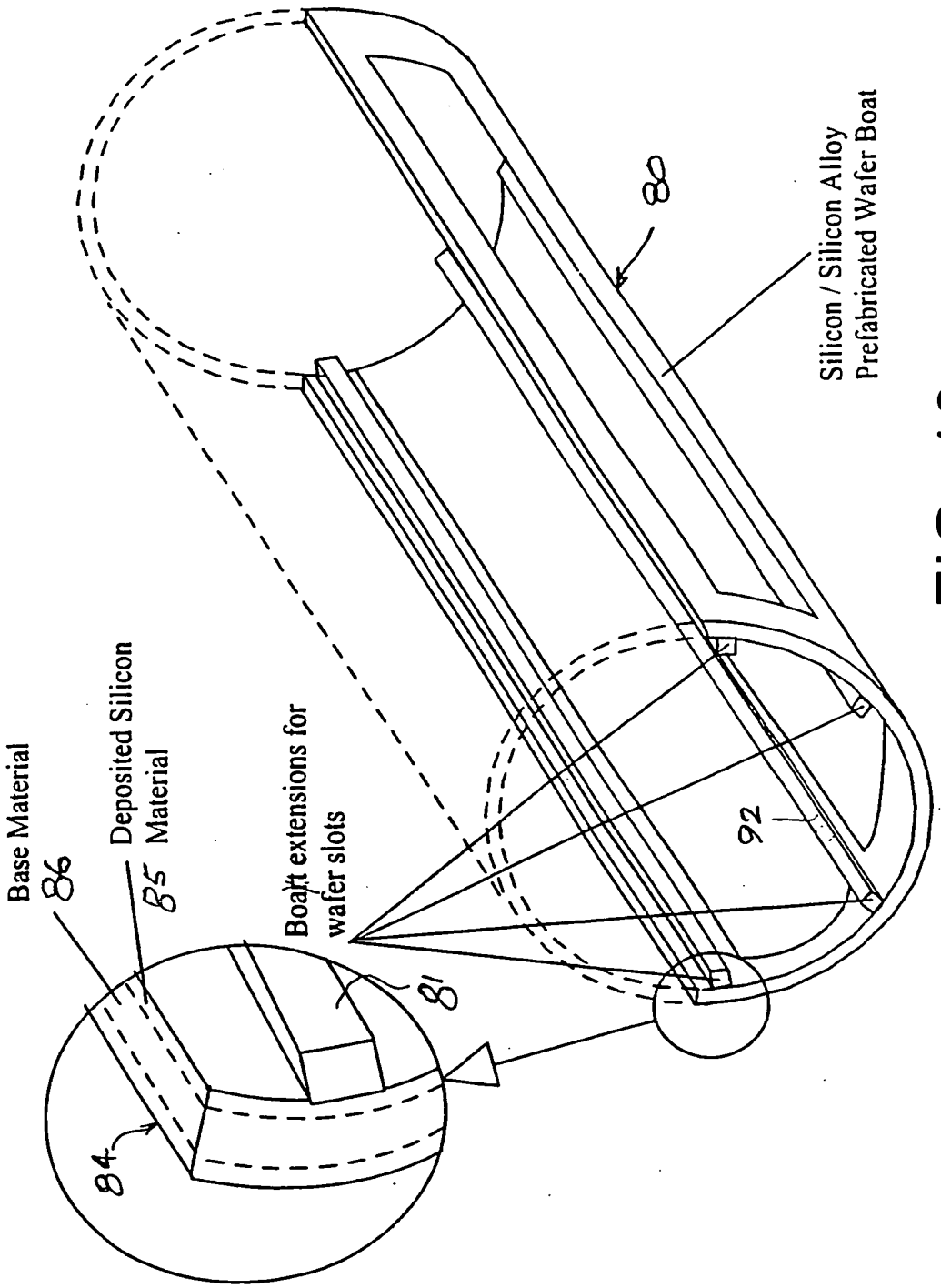

Base Material
86
Deposited Silicon
Material
85
Boat extensions for
wafer slots
81
84
80
Silicon / Silicon Alloy
Prefabricated Wafer Boat
92

FIG. 10

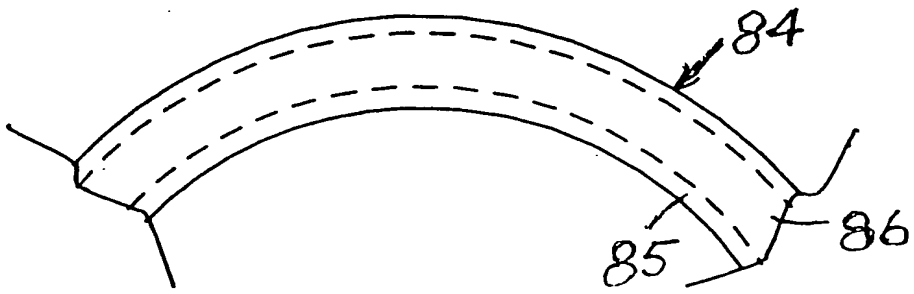


FIG. 11

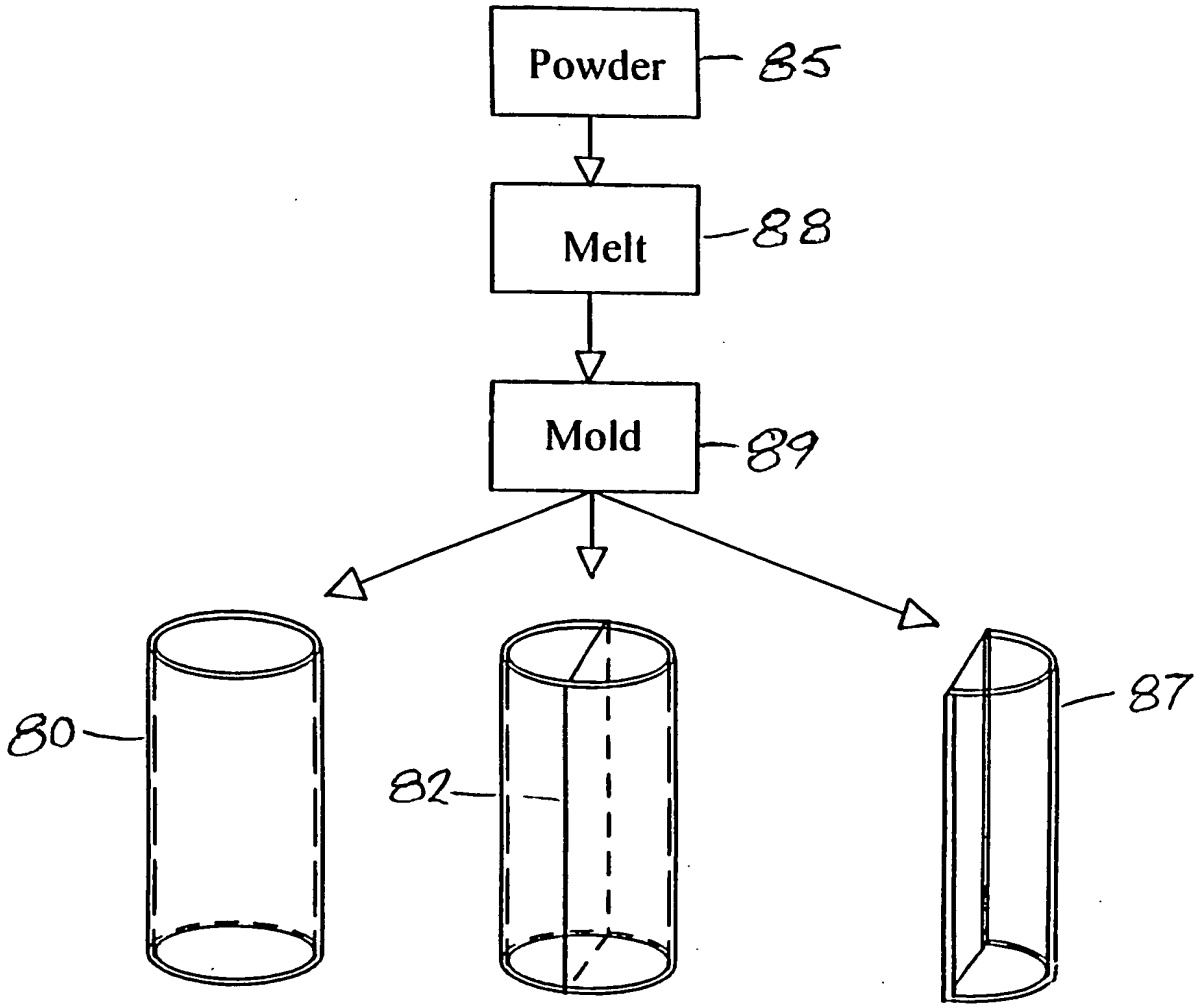


FIG. 12

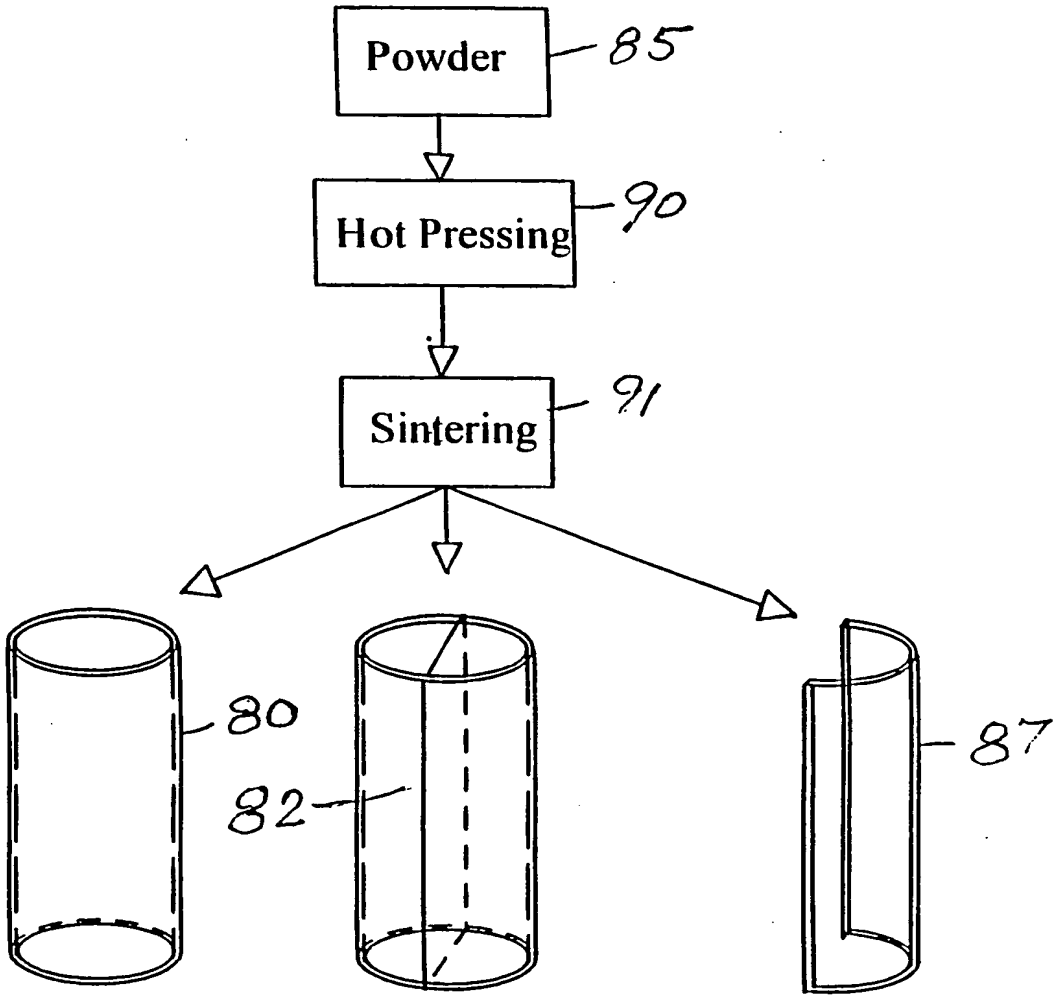


FIG. 13

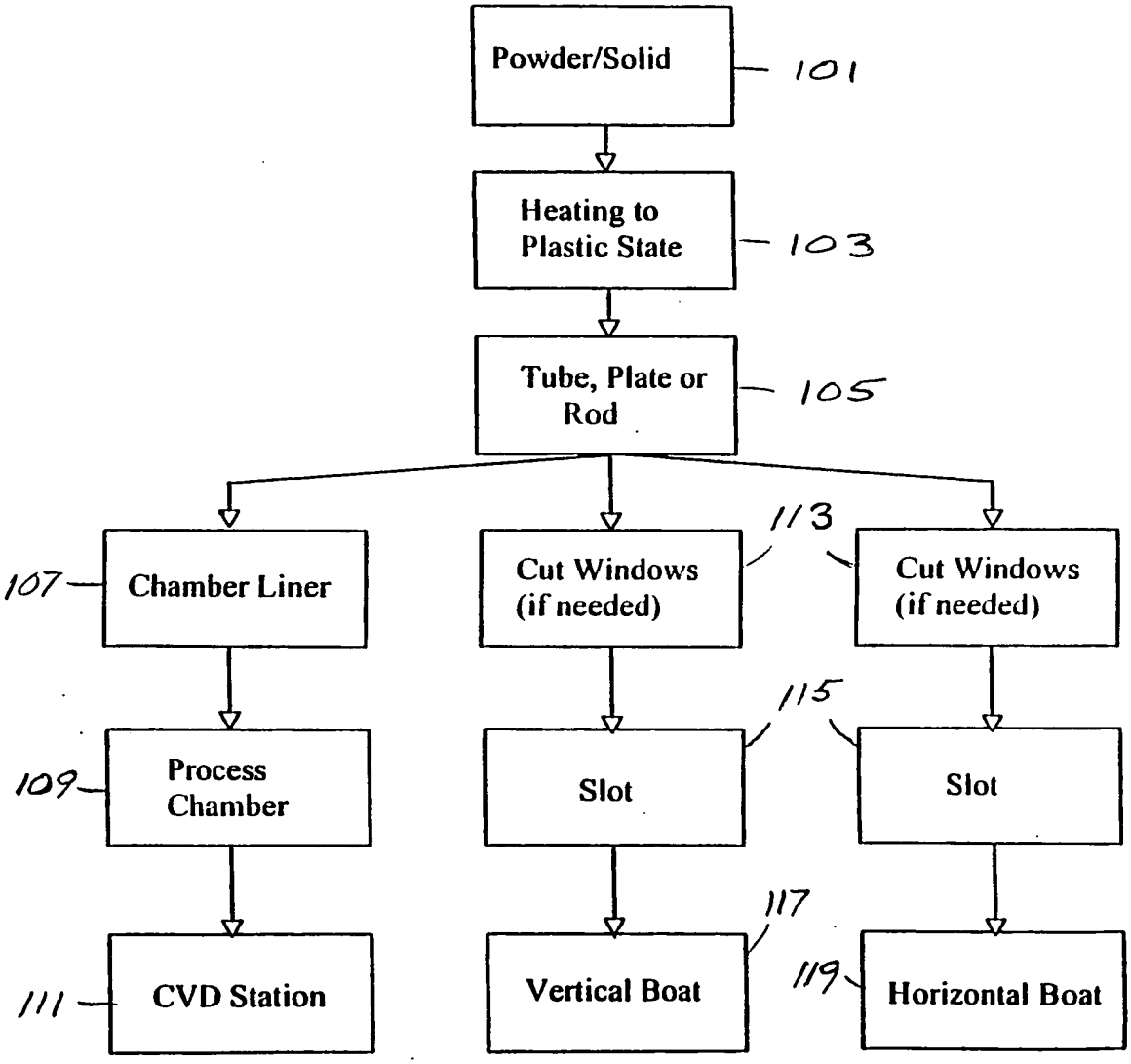

Powder/Solid
101
Heating to Plastic State
103
Tube, Plate or Rod
105
107
Chamber Liner
Cut Windows (if needed)
113
Cut Windows (if needed)
109
Process Chamber
115
Slot
Slot
111
CVD Station
117
Vertical Boat
119
Horizontal Boat

FIG. 14

FIG. 15

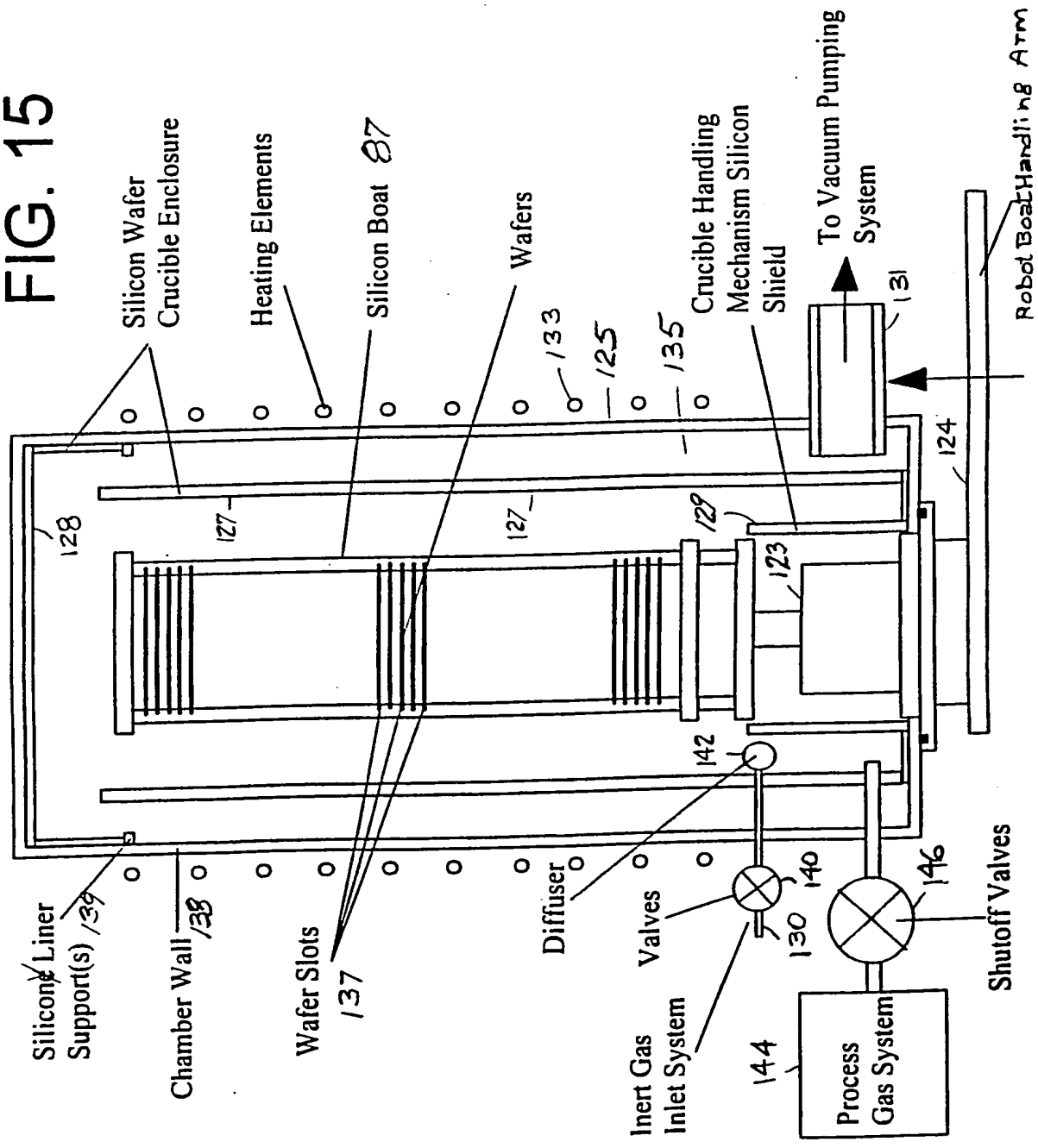
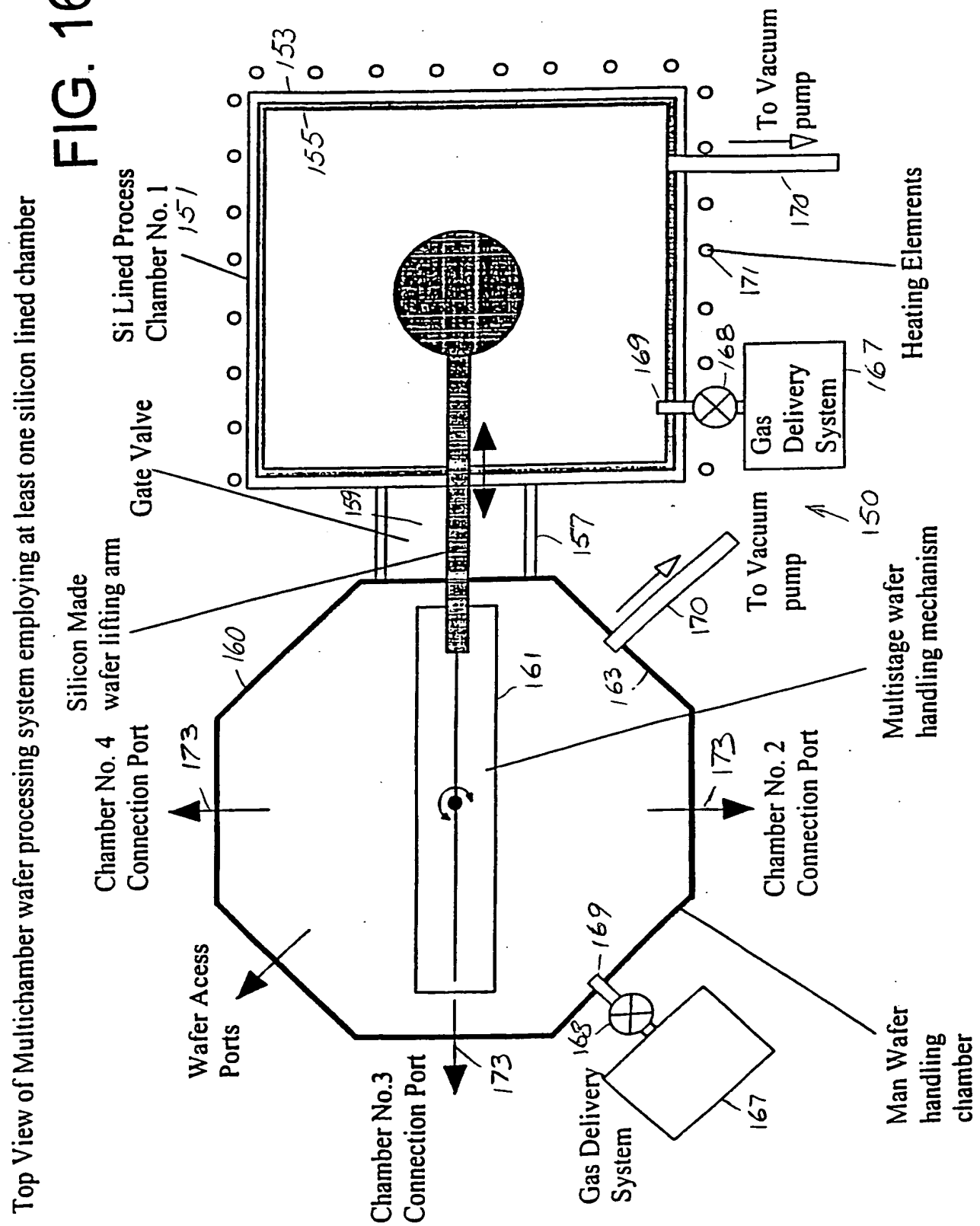

Silicon Wafer Crucible Enclosure
Heating Elements
Silicon Boat 87
Wafers
133
125
135
Crucible Handling Mechanism Silicon Shield
To Vacuum Pumping System
131
Robot Boat Handling Arm
124
128
127
127
129
123
142
Silicon Liner Support(s) 139
Chamber Wall 138
Wafer Slots 137
Diffuser
Valves
140
130
146
Shutoff Valves
Inert Gas Inlet System
144
Process Gas System

FIG. 16


Top View of Multichamber wafer processing system employing at least one silicon lined chamber
Si Lined Process Chamber No. 1
151
153
155
To Vacuum pump
170
171
Heating Elemrents
Gate Valve
159
157
169
168
Gas Delivery System
167
Silicon Made wafer lifting arm
160
161
163
To Vacuum pump
170
150
Multistage wafer handling mechanism
Chamber No. 4 Connection Port
173
Chamber No. 2 Connection Port
173
Wafer Acess Ports
Chamber No.3 Connection Port
173
Gas Delivery System
168
169
167
Man Wafer handling chamber

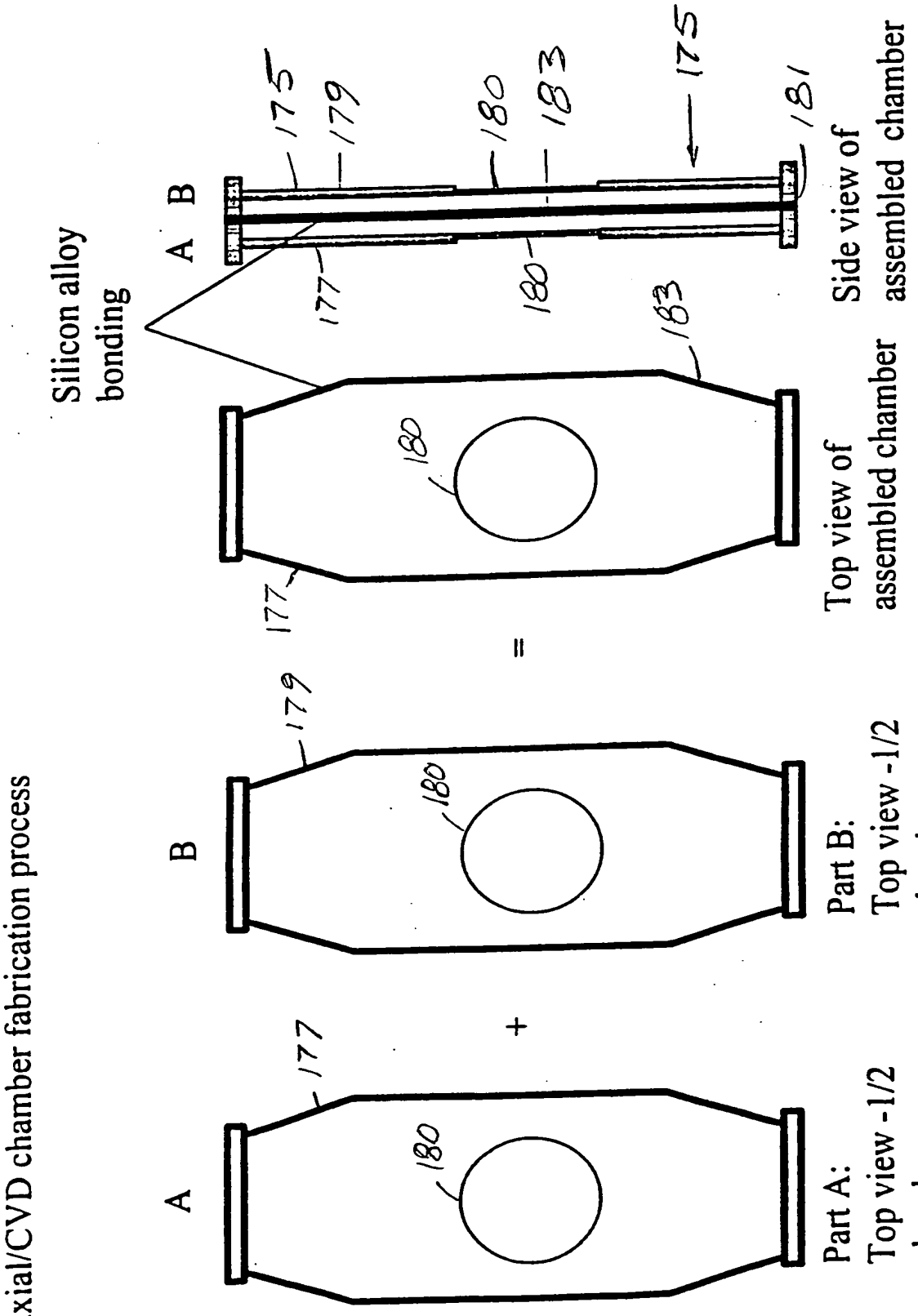

Epitaxial/CVD chamber fabrication process
A
177
180
Part A:
Top view -1/2
chamber
+
B
179
180
Part B:
Top view -1/2
chamber
=
Silicon alloy
bonding
A B
177
179
175
180
183
175
181
177
180
183
Top view of
assembled chamber
Side view of
assembled chamber

FIG. 17

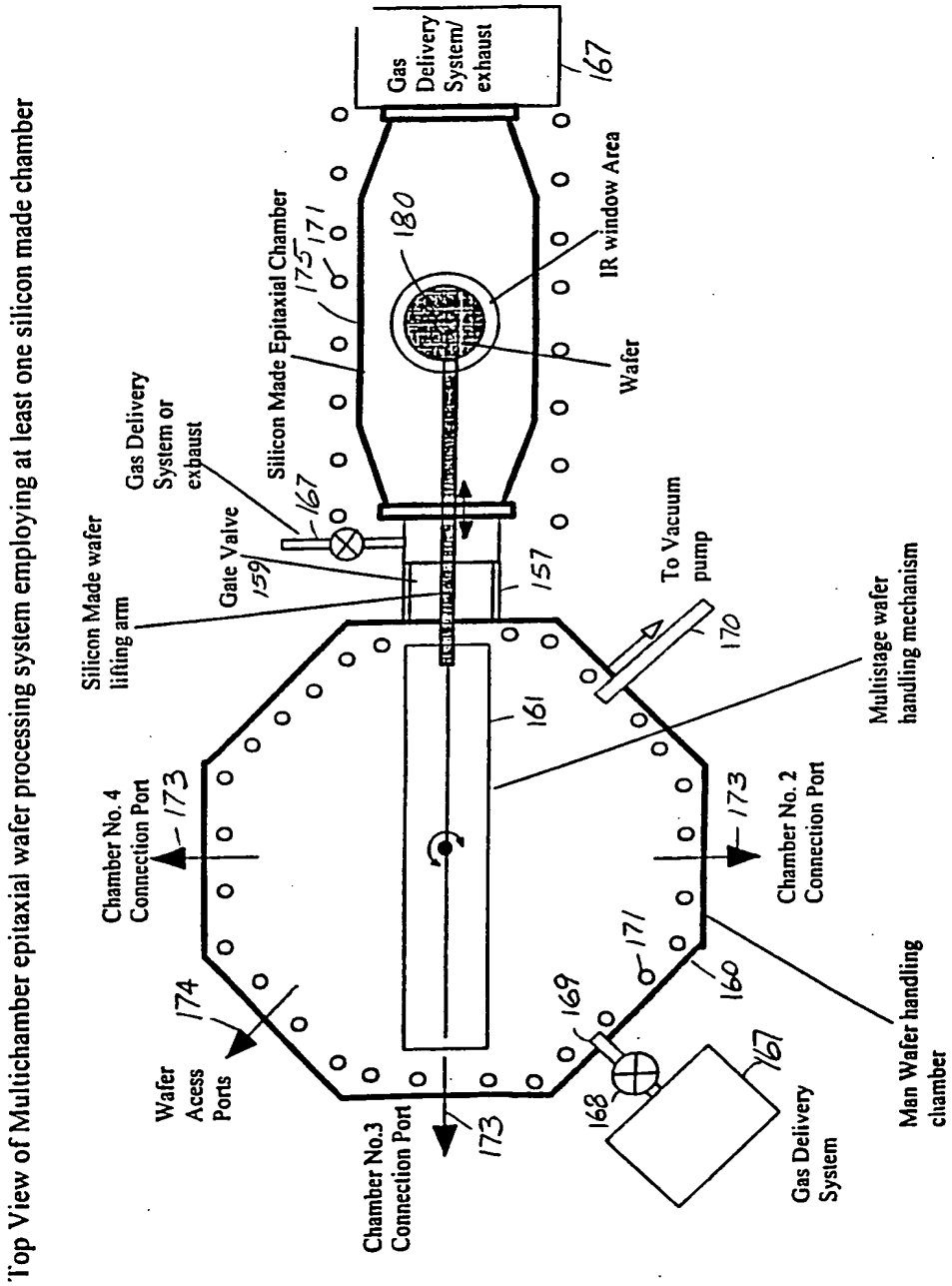

Top View of Multichamber epitaxial wafer processing system employing at least one silicon made chamber
Gas Delivery System/ exhaust
167
Silicon Made Epitaxial Chamber
175
171
180
IR window Area
Wafer
Gas Delivery System or exhaust
Gate Valve
159
Silicon Made wafer lifting arm
157
To Vacuum pump
170
Mulistage wafer handling mechanism
161
Chamber No. 4 Connection Port
173
Chamber No. 2 Connection Port
Wafer Acess Ports
174
169
160
Man Wafer handling chamber
168
Gas Delivery System
Chamber No.3 Connection Port

FIG. 18

Side View of Multichamber epitaxial wafer processing system employing at least one silicon made chamber

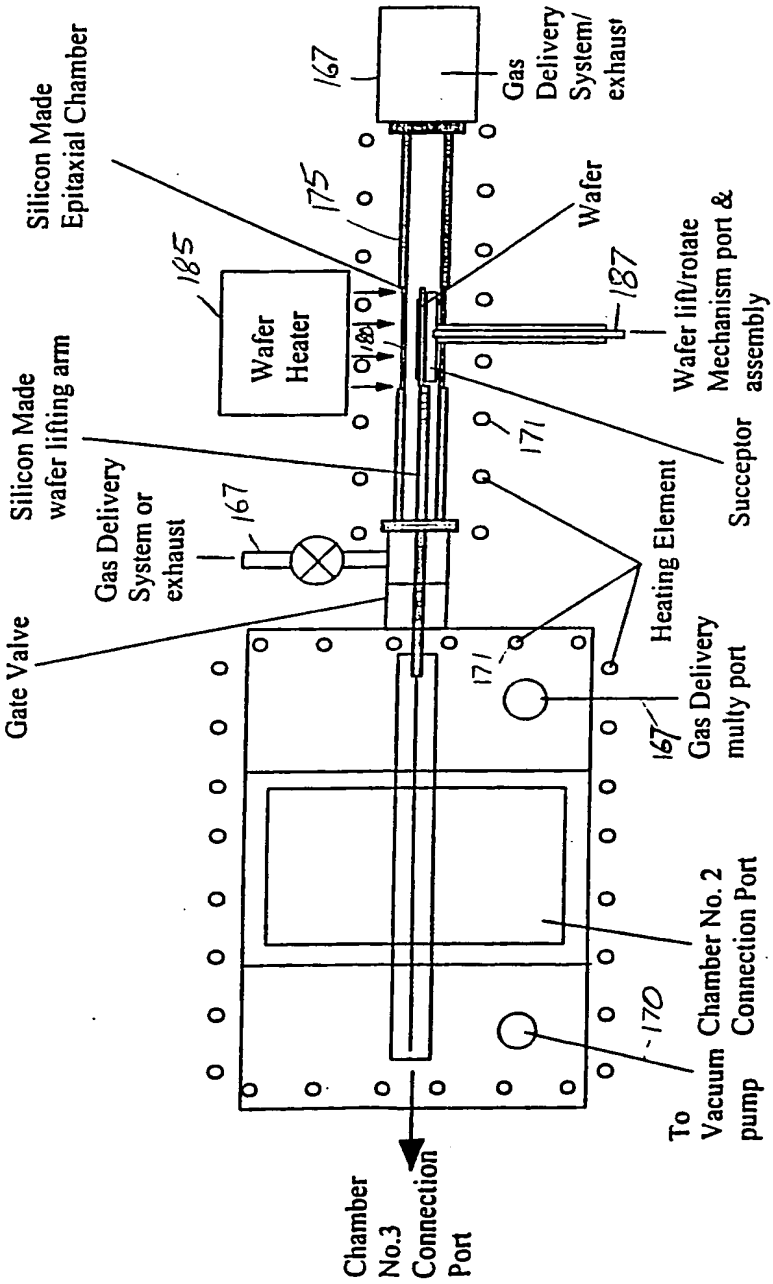


FIG. 19

The diagram was established by thermal and X-ray analysis Because of the absence of diffusion during solidification, the solidus temperature

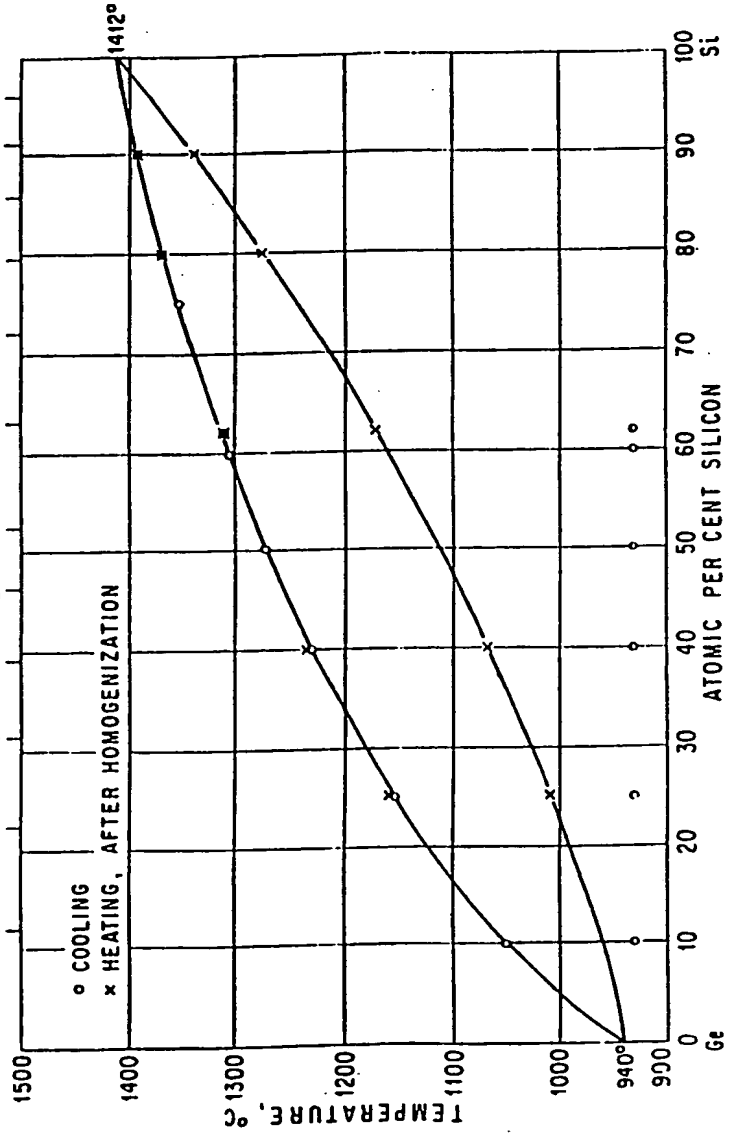


FIG. 20

on normal cooling from the molten state was found at a temperature about 10°C below the melting point of Ge, in alloys up to about 60 at. % Si. Heating curves